

in the specification at page 6, lines 2-3, which discloses an reaction pressure of 0.01 to 3 bar and clearly includes pressure ranges under vacuum.

Dependent claim 23 has been amended to comport with the amendment to claim 15.

In the amendments to claims 15 and 23, Applicants are simply claiming less than the full scope of their disclosure and this is allowable since "[i]t is for the inventor to decide what bounds of protection he will seek." *In re Johnson*, 194 U.S.P.Q. 187,196 (C.C.P.A.1977), citing, *In re Saunders*, 58 C.C.P.A. 1316,1327,444 F.2d 599,607,170 U.S.P.Q. 213,220 (1971).

As such, the amendments are fully supported by the application as originally filed. Accordingly, no new matter has been introduced by these amendments.

## **II. The Rejection Under 35 U.S.C. §102(b) and Traverse**

The Examiner has rejected claims 15-22, 24-26, 28-29, 31, and 32 under 35 U.S.C. §102(b) as anticipated by Suchsland et al., U.S. Patent No. 5,847,207 ("*Suchsland*"). Specifically, the Examiner relies on Example 10 of *Suchsland* as his basis of rejection and states that the claims are identical to the prior art version (see Office Action dated June 28, 2001, at pages 2-3). Applicants respectfully traverse this rejection.

For a 35 U.S.C. §102 rejection to be proper, a single prior art reference must contain every element of the claimed invention, including all claim limitations. See *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 U.S.P.Q. 2D (BNA) 1913, 1920 (Fed. Cir.1989), cert. denied, 493 U.S. 853, 107 L. Ed. 2d (1989).

As amended, the present claims recite, *inter alia*, a process for the hydrolysis of 2-hydroxy-4-methylthiobutyronitrile comprising a hydrating step wherein the hydration is carried out at a temperature of less than or equal to 60°C and under vacuum.

Contrary to the present invention, Example 10 of *Suchsland* does not teach that the operation of the first step is carried out under vacuum. In fact, none of the exemplified processes disclosed in *Suchsland* teach or suggest operation of the hydrating step under vacuum. Therefore, *Suchsland* does not teach or suggest every element of the presently claimed invention and therefore does not anticipate the present invention. Accordingly, Applicants respectfully request that the rejection under 35 U.S.C. §102(b) be withdrawn.

## **II. The Rejection Under 35 U.S.C. §103(a) and Traverse**

The Examiner has rejected claims 23, 27, 30, 33, and 34 under 35 U.S.C. §103(a) as unpatentable over *Suchsland*, U.S. Patent No. 5,847,207 in view of Hsu et al., U.S. Patent No. 5,998,567 (“*Hsu*”).

The Examiner alleges that *Suchsland* discloses process parameters which fall within the scope of the presently claimed invention, specifically Example 10 (see Office Action dated June 28, 2001, page 4). The Examiner acknowledges that *Suchsland* does not teach operating pressure ranges for hydrating steps (a) and (b) between 0.01 and 3 bar and 0.5 and 5 bar, respectively (Id.). Additionally, the Examiner points out that *Suchsland* does not teach recycling of evaporated excess water or a concentrated feed stream containing 50 or 80 wt.% 2-hydroxy-4-

methylthiobutyronitrile (Id.). However, the Examiner relies on *Hsu* to teach the operating pressure range from 0 to 1 bar (*see* Office Action dated June 28, 2001, page 5).

Applicants respectfully traverse this rejection on the basis that this invention is not made obvious by the cited art, either alone or in combination.

In determining obviousness, 35 U.S.C. § 103 expressly requires consideration of the claimed invention "as a whole." For a *prima facie* case of obviousness, the Examiner must show some motivation for modifying the teachings of the references, and a reasonable expectation of success in doing so. *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991). The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification. *In re Gordon*, 733 F.2d 900, 902, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984).

As amended, the present invention recites, *inter alia*, a process for the hydrolysis of 2-hydroxy-4-methylthiobutyronitrile (HMTBN) comprising:

- (a) hydrating 2-hydroxy-4-methylthiobutyronitrile in a sulphuric acid medium to produce 2-hydroxy-4-methylthiobutyramide, wherein the molar quantity of sulphuric acid relative to the 2-hydroxy-4-methylthiobutyronitrile is between 0.6 and 0.88, the molar quantity of water to 2-hydroxy-4-methylthiobutyronitrile is between 1 and 3, and further wherein the hydration is carried out at a temperature of less than or equal to 60°C and under vacuum; and

LAW OFFICES

FINNEGAN, HENDERSON,  
FARABOW, GARRETT,  
& DUNNER, L.L.P.  
1300 I STREET, N. W.  
WASHINGTON, DC 20005  
202-408-4000

- (b) hydrolyzing the 2-hydroxy-4-methylthiobutyroamide in the presence of an additional quantity of water to produce 2-hydroxy-4-methylthiobutyric acid in a reaction mass.

*Suchsland* does not teach or suggest every element of the presently claimed invention. Applicants further submit that *Hsu* does not cure the deficiencies of *Suchsland*. Specifically, *Suchsland* does not teach or suggest operation of the hydration step under vacuum. The only use of vacuum disclosed in *Suchsland* is in the concentration of the amide reaction mixture in order to concentrate it by liberating water via evaporation (*Suchsland*, col. 5, lines 50-51). The Examples which exemplify use of vacuum specifically, Examples 2, 9, 10, 16, and 17, apply vacuum after the amide has been formed. In addition, because *Suchsland* does not even hint at operating the hydrating reaction, the first step, under vacuum, one of ordinary skill in the art would not have been motivated to modify the process disclosed in *Suchsland* to run the hydrating reaction step under vacuum in order to arrive at the presently claimed process.

*Hsu* teaches a continuous 2-step hydrolysis process to prepare HMTBA from HMTBN, using sulphuric acid and a molar quantity of sulphuric acid to HMTBN ranging from 0.7 to 1.5 and most preferably between 0.95 and 1.05 during steady state operation. (See *Hsu*, col. 5, lines 49-52). *Hsu* discloses that the hydrating step which converts 2-hydroxy-4-methylthiobutyronitrile into 2-hydroxy-4-methylthiobutyramide is carried out at a temperature between 40-70°C, preferably between about 60-65 °C (see *Hsu*, col. 6, lines 16-18). The hydrating step is conducted at a pressure of 0 and about 15 psig when sulphuric acid is used (*Id.*,

col. 8, line 9). *Hsu* teaches that the hydrolyzing step which reacts the amide with water to form HMTBA in a plug flow reactor (PFR) is run as a temperature ranging from about 70-120°C (*Id.*, col. 7 lines 53-54) and a pressure between 0 and about 15 psig with up to 15 psig back pressure possible (*Id.*, col.15, lines 9-11).

The nomenclature, psig, refers to gauge pressure, thus the actual operating pressure range for *Hsu*'s first step ranges from 14.696 to about 29.696 psi (1.013 to 2.046 bar). The presently claimed hydrating step is run under vacuum. Nothing in *Hsu* teaches or suggests that its first step can be run under vacuum, only the present invention discloses this process condition.

Additionally, in the hydration step, the present invention requires a low sulphuric acid to HMTBN ratio (0.6 to 0.88). *Hsu* actually teaches away from utilizing an acid/nitrile ratio between 0.6 to 0.88 to achieve high selectivity of the 2-hydroxy-4-methylthiobutyric acid stating that the preferred acid/nitrile ratio is 1.0-1.2. However, the present specification reveals that use of a sulphuric acid to nitrile molar ratio of between 1.0 and 1.2, the range taught in *Hsu*, results in large quantities of ammonium sulphates (solids) proportional to the quantity of acid introduced which causes a major problem for industrial discharges. The use of this acid/nitrile ratio range results in a highly acidic medium which is very corrosive when hot and requires use of exotic (costly) materials of construction (specification, page 4, lines 1-10).

The present specification states that the rate of the hydration of 2-hydroxy-4-methylthiobutyronitrile to 2-hydroxy-4-methylthiobutyroamide is inversely proportional to the quantity of water (see specification, page 4, line 27 through page 5, line 6). As such, a molar quantity of water to 2-hydroxy-4-methylthiobutyronitrile between 1 and 3.0 is preferred (*Id.*, page

5, lines 6-9). *Hsu* is completely silent with regard to this molar ratio. There is nothing in *Hsu* to suggest or motivate one of ordinary skill in the art to choose a low water/nitrile ratio to optimize the hydration rate.

In view of the above discussion, Applicants submit that there is nothing in the *Hsu* or *Suchsland* references to motivate one of ordinary skill in the art to modify the process of *Suchsland* to include the specific combination of parameters necessary for hydrating 2-hydroxy-4-methylthiobutyronitrile in a sulphuric acid medium to produce 2-hydroxy-4-methylthiobutyramide, wherein the molar quantity of sulphuric acid relative to the 2-hydroxy-4-methylthiobutyronitrile is between 0.6 and 0.88, the molar quantity of water to 2-hydroxy-4-methylthiobutyronitrile is between 1 and 3, and at the process is run a temperature of less than or equal to 60°C and under vacuum as presently claimed. As such, the present invention is not obvious over the combination of *Suchsland* in view of *Hsu*.

Accordingly, Applicants respectfully request that the rejection under 35 U.S.C. §103(a) be withdrawn.

### CONCLUSION

Given the foregoing remarks, Applicants respectfully submit that all the pending claims are in condition for allowance. A prompt and favorable action is requested.

LAW OFFICES

FINNEGAN, HENDERSON,  
FARABOW, GARRETT,  
& DUNNER, L.L.P.  
1300 I STREET, N. W.  
WASHINGTON, DC 20005  
202-406-4000

Please grant any extension of time required to enter this response and charge any additional required fees to our deposit account No. 06-916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,  
GARRETT & DUNNER, L.L.P.

Date: October 26, 2001

By: Carol Einaudi

Carol Einaudi

Reg. No. 32,220

LAW OFFICES

FINNEGAN, HENDERSON,  
FARABOW, GARRETT,  
& DUNNER, L.L.P.  
1300 I STREET, N.W.  
WASHINGTON, DC 20005  
202-408-4000

**APPENDIX TO AMENDMENT OF OCTOBER 26, 2001**

**Version with Markings to Show Changes Made**

**Amendments to the Claims**

15. (Amended) A process for the hydrolysis of 2-hydroxy-4-methylthiobutyronitrile comprising:
- (a) hydrating 2-hydroxy-4-methylthiobutyronitrile in a sulphuric acid medium to produce 2-hydroxy-4-methylthiobutyramide, wherein the molar quantity of sulphuric acid relative to the 2-hydroxy-4-methylthiobutyronitrile is between 0.6 and 0.88, the molar quantity of water to 2-hydroxy-4-methylthiobutyronitrile is between 1 and 3, and further wherein the hydration is carried out at a temperature of less than or equal to 60°C and under vacuum; and
  - (b) hydrolyzing the 2-hydroxy-4-methylthiobutyroamide in the presence of an additional quantity of water to produce 2-hydroxy-4-methylthiobutyric acid in a reaction mass.
23. (Amended) A process according to claim 1, wherein the hydrating step (a) is carried out at a pressure ranging between 0.01 and [3] 1.0 bar.